

Shedding light on tactical performance and tactical behavior concepts with a particular reference to soccer

Lançando luz sobre os conceitos de desempenho tático e comportamento tático com uma referência especial ao futebol

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Abstract – Tactical aspects play a significant role in soccer, as a team sport, considering the inherent unpredictability of the actions during a game. Therefore, measuring tactical variables is essential for training planning in soccer and other team sports. However, previous studies have interchangeably used the terms “tactical behavior” and “tactical performance” to refer to the collected variables, which has become a source of questioning in recent literature. In this point-of-view article, the tactical behavior and tactical performance concepts are defined, discussed, and exemplified based on previous studies. While tactical behavior measures are associated with descriptions of the actions, tactical performance variables are assumed to classify and interpret such behaviors considering reference values. Finally, examples of instruments for collecting each data are provided.

Key words: Soccer; Team sports; Tactics; Match analysis; Performance analysis.

Resumo – Aspectos táticos representam um ponto chave no futebol enquanto um esporte coletivo considerando a imprevisibilidade das ações durante um jogo. Medir variáveis táticas é importante para o planejamento do treinamento no futebol e nos outros esportes coletivos. Estudos prévios, contudo, utilizaram de forma intercambiável os termos “comportamento tático” e “desempenho tático” para se referir às variáveis coletadas, o que se transformou em um ponto de dúvida na literatura recente. Neste artigo de ponto de vista, os conceitos de comportamento e desempenho tático são definidos, discutidos e exemplificados com base em estudos prévios. Enquanto comportamento tático está associado à descrição das ações, o desempenho tático é assumido como a classificação e a interpretação destes comportamentos considerando valores de referência. Finalmente, exemplos de instrumentos para a coleta de cada dado são apresentados.

Palavras-chave: Futebol; Esportes coletivos; Tática; Análise de jogo; Análise de desempenho.

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INTRODUCTION

Over the past few years, research on the tactical aspects of team sports has significantly advanced. From a game-based perspective, a tactical action is defined in this paper as a player's response to emerging problems during gameplay, according to previous studies^{1,2}. The increased number of published studies in this topic has been accompanied by a vast array of dependent variables collected by authors due to the development of automatic match-analysis systems³. Although all these tools analyze players' actions within game-based contexts, they provide coaches and practitioners with different information regarding the concept of tactical performance and behavior, which is the contradiction addressed in this present perspective article.

Previous studies have used the terms 'tactical behavior' and 'tactical performance' interchangeably. For example, the frequency of tactical principles has been treated as a measure of tactical behavior⁴ or performance⁵ while the percentage of successful actions has been used as both a tactical behavior⁶ and a tactical performance⁷ measure. However, the terms 'performance' and 'behavior' have notably different definitions in the scientific literature. Therefore, this contradiction impairs the ability of readers and other scientists to understand the purpose of articles, reduces the quality of systematic reviews, and delays scientific progress. To address this issue, the concepts of tactical behavior and tactical performance will be defined in the following sections, and examples of studies that investigated these concepts will be included to illustrate their differences. Finally, potential research areas will be presented, including a pathway to develop performance indicators from behavior measurements.

Before delving deeper into this topic, it is crucial to consider the scope of this point of view. Previous studies examined the declarative and procedural aspects of tactical constructs related to players' knowledge about the game^{8,9}. Declarative measurements assess players' structured and verbalizable knowledge of "what to do" but do not necessarily capture the action itself. As a result, the responses given by players may not accurately reflect their decision-making in game-based tasks, leading to weak correlations between actions performed in game-based tasks and those outside of this context¹⁰. Therefore, this study will only consider measures of tactical behavior and performance in game-based tasks (i.e., the procedural construct).

MEASURES OF TACTICAL BEHAVIOR

Behavior has been defined in the scientific literature as the observable action of a person in each context¹. Therefore, measures of behavior are inherently descriptive. When collecting data on tactical behavior, researchers typically examine "what" and "how" actions are performed by players. For example, previous studies measured the frequency of tactical actions, such as core tactical principles⁴, or even technical-tactical actions – such as passing or shooting – to characterize the players' behavior.

In general, measures of tactical behavior can be collected from two different sources. On the one hand, observational instruments have primarily been adopted to describe players' actions in game-based tasks. Examples of instruments within this approach in soccer include the System of Tactical Assessment in Soccer¹¹, the Game Performance Evaluation Tool¹², and the Social Network Analysis¹³ which measure and report frequencies of actions for further analysis³. On the other hand, tracking systems have recently been adopted to capture

players' positioning on the pitch - which is in line with the previously mentioned concept of tactical action - and can therefore be used for tactical behavior analysis³. Examples of such technology include measures of a team's length, width, and spread from a collective perspective, and spatial exploration from an individual one. Interestingly, a recent study reported that the tactical behavior measures drawn from tracking systems are more reliable than those obtained through observational ones. This finding suggests that tracking systems may be a more valid and reliable method for measuring tactical behavior and could be an important tool for future research in this area³.

Additionally, research on tactical behavior can also help coaches to identify strengths and weaknesses in their team's performance. By analyzing the frequency and quality of specific tactical actions, coaches can identify areas where their team is excelling and where they need improvement. For example, when aiming at improving players' decisions on "how," "to where," and "when" to pass the ball to a teammate, it is recommended that the task allow the players to pass as much as possible (also considering other pedagogical principles, such as representativeness and variability). Overall, research on tactical behavior can provide valuable insights into the performance of team sports players and can help coaches to improve their team's performance by selecting appropriate training tasks and identifying areas for improvement.

Measuring players' preferred actions is another way to analyze tactical behavior. Previous research has shown that midfielders tend to have higher centrality values than players in other positions, indicating that this aspect should be a focal point in position-specific training sessions. Moreover, this information could be valuable for talent identification, as it allows coaches to identify players who excel in the most relevant tactical skills based on the match's demands.

MEASURES OF TACTICAL PERFORMANCE

On the other hand, the term "performance" is typically used to interpret behavioral data in order to draw classifications. For example, a team's tactical performance is assumed to be higher when it creates more goal-scoring opportunities *than* the opponent. The essential word in this definition is "than". When examining performance indicators, a standard or reference value must be established to allow appropriate conclusions. This reference value may be the team itself (or the player within a team) when comparing data from multiple instances, data from the literature, data from elite players (when adopting the expert-novice paradigm), among other possibilities. For example, a previous study showed that performance in tactical actions improved after a training period using small-sided games¹⁴. This conclusion was possible because a baseline reference value was established and compared to the observed value. Thus, it was possible to assume an improvement in tactical skills, which is not always possible when solely describing behavior.

It is important to note that while observational instruments and tracking systems can be used to collect data on tactical performance, these instruments primarily reflect a specific trend that allows for the classification of behavior, which then leads to obtaining a performance measure. Therefore, tactical performance measurements typically account for indices or percentages of correct actions, such as the percentage of successful offensive tactical actions extracted from the FUT-SAT or the decision-making score collected by the GPAI. In these cases, it is generally expected that a higher score or percentage indicates better actions or better performance. However,

Table 1. Summary of possible variables related to tactical behavior and tactical performance.

Instrument	Variable	Definition	Classification
FUT-SAT	Frequency of tactical principles	Frequency of each offensive and defensive core tactical principle.	Tactical Behavior
FUT-SAT	Percentage of successful tactical actions	The ratio between the successful tactical actions and the total tactical actions. It can be calculated for each tactical principle or considering them all together. Higher values indicated better performance.	Tactical Performance
GPET	Technical execution	The index provided by the instrument concerning technical-tactical actions of dribbling, passing, supporting, and controlling. Higher values indicate better performance.	Tactical Performance
GPET	Decision-making	The index provided by the instrument concerning decision-making in actions of dribbling, passing, supporting, and controlling. Higher values indicate better performance.	Tactical Performance
SNA	Centrality measures	Level of participation of each node (player) in a given adjacency matrix (the passing matrix, for example). Indicates preferential paths for ball circulation.	Tactical Behavior
SNA	Network Density	Level of variability and homogeneity of the interactions between teammates within a team. Although it is generally a measure of behavior, studies have shown that more homogeneous and decentralized behaviors are associated with better outcomes, therefore it might be assumed as a performance indicator in the future.	Tactical Behavior and Tactical Performance
Positional Analysis	Team and players' spatial occupation	Values regarding the occupation of the pitch from collective (length, width, compactness, spread) and individual (spatial exploration) perspectives.	Tactical Behavior
Positional Analysis	Interpersonal coordination and entropy	Measures of the variability of the movements and the interpersonal synchronization among teammates. Although it is generally a measure of behavior, studies have shown that reducing entropy and increasing interpersonal coordination is associated with better outcomes, therefore it might be assumed as a performance indicator in the future.	Tactical Behavior and Tactical Performance

the same cannot be said for isolated behavioral measurements. For example, a player who performed more passes in a match does not necessarily have a better passing performance than a player who performed fewer passes, as the percentage of successful actions could be lower for the former. Thus, it's strongly recommended to separate the concepts of tactical behavior and tactical performance.

Longitudinal studies examining changes in tactical constructs often use performance measurements to evaluate the effectiveness of teaching models since it allows for classification. For instance, research has demonstrated that numerically unbalanced small-sided games are more effective at improving tactical performance than balanced games¹⁴. Conversely, if only behavioral data is used, changes can be described, but determining whether they are positive or negative would require extrapolating and speculating on the results.

An interesting topic in tactical performance analysis is the use of non-linear positional metrics, such as interpersonal coordination and movement entropy². Initially collected as tactical behavior measures, these variables have been shown to be associated with successful outcomes when they are higher for interpersonal coordination and lower for entropy. As a result, they could be used as performance variables to test the effects of training interventions. However, caution is still needed when interpreting such data as performance-related due to the lack of a clear expert-novice paradigm or a controlled experimental design.

FINAL COMMENTS

Table 1 provides an overview of examples of measurements related to both tactical behavior and tactical performance. While the table is not exhaustive, as

new variables are frequently proposed in the literature, it can assist researchers in understanding the basic measures and in better aligning their research problems with the selected dependent variables.

The field of tactical analysis in team sports, particularly soccer, is expanding and evolving into a more intricate science. Initially, the examination of tactical actions only involved recording discrete events, but it has become increasingly complex due to the introduction of new variables and tools. For instance, from the behavioral data gathered from technical-tactical actions related to shooting on goal, recent research has introduced a performance measurement known as expected goals (xG)¹⁵. This metric allows for a clear understanding of trends, as higher values are typically associated with increased chances of winning. Notably, all data is collected through observational instruments that have been in use for decades.

To ensure accuracy and relevance in studies of team sports, such as soccer, it is important for researchers to use reliable and valid instruments for collecting tactical data from players during game-based tasks. However, it is also necessary to define the scope of the research to align the data with the research objectives. This involves deciding whether the research will primarily focus on describing the actions (tactical behaviors) or classifying them (tactical performance).

Compliance with ethical standards

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Ethical approval

This research is in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed the experiments: GMP. Performed the experiments: GMP. Analyzed the data: GMP. Contributed reagents/materials/analysis tools: GMP. Wrote the paper: GMP.

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